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ABSTRACT

This is one of a series of units for environmental education developed by the Highline Public Schools. There are seven concepts in this unit on recycling which is designed for grade five and six students. Each concept has one lesson that is comprised of several activities. Several suggested extra activities have been added to further the students' investigations and to enhance their understanding of glass and the problems related to glass. If all activities are used, the unit will take longer than three weeks. The materials were evaluated; evaluation data may be obtained from the Highline Public Schools. (RH)

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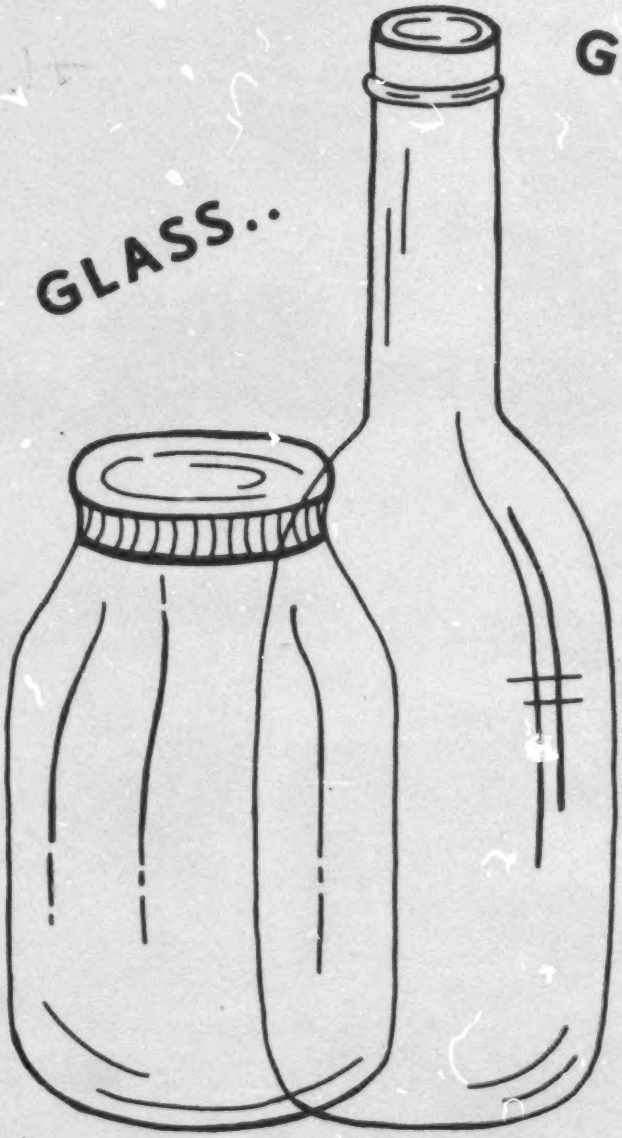
GLASS..

GLASS..

GLASS..

GLASS..



AND THEN — RECYCLING ....

by Dave Lewis

An Environmental Learning Experience for 5th-6th grade levels. One of many "ELE PAKS" available for all areas.

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NATURE KNOWS BEST

PROJECT ECOLOGY TITLE III

The Kids Who Participated in the Pilot Evaluation Program

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Len Baron	Tom Thornton	Lisa Williams
Sheryl Mabeus	Todd Wheatley	Monica Cromwall
Kellie Haggen	Lori Harrell	Dave Flenniken
Todd Loreth	Laura Voelker	Sean McCabe
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Rob Helmbrecht		

The Readers Who Studied, Critiqued & Offered Suggestions & Ideas for Improvement

Marsha Campbell, Gregory Heights Elementary, Grade 6
Gary Favro, Bow Lake Elementary, Grade 5
Art Sills, Sunnydale Elementary, Grade 6
Mike Thorson, Gregory Heights Elementary, Grade 6
Roger Morrow, Federal Way School District

The Author/Teacher Who Developed This Environmental Learning Experience (ELE)

David Lewis — Valley View Elementary — Grade 6

Evaluation Results Regarding This ELE May Be Obtained by Including This Page and a Self Addressed Stamped Envelope To

Highline Public Schools, District 401
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EVERYTHING IS CONNECTED TO EVERYTHING ELSE

PROJECT ECOLOGY

THERE IS NO SUCH THING AS A FREE LUNCH

PROJECT ECOLOGY · TITLE III

EVERYTHING MUST GO SOMEWHERE

PROJECT ECOLOGY · TITLE III

BACKGROUND INFORMATION

What is a cycle? A cycle is a complete set of events or phenomena in the same sequence.

What is cullet? Cullet is glass that is smashed up before recycling it into other glass products.

What is meant by recycling? Recycling is to reuse a product or reprocess it and made another product from the one you started with.

What is glass? Glass is a super cooled liquid that whose basic ingredients are sand, limestone, and sodium carbonate.

Why do we need to recycle materials? There is a limit to the amount of raw materials available to man. Many materials which could be recycled are lost because of the disposal systems or the feeling that there is a never ending supply of material.

Can man really solve environmental problems? Most of the problems can be eliminated or curbed by wise planning and use of raw materials, recycling of used materials, and active participation by an informed citizenry. We have to solve the problems or face the possibility of extinction.

Is it necessary for every one to participate in solving the problems? Yes, a few can do their part but it takes a concerted and consistent effort on everyone's part to get the job done.

What is one thing man must do? Change his life style - become more aware of items that can be recycled and assist in their recycling.

CONCEPTUAL OVERVIEW OF UNIT

1. An inquiry investigation of the characteristics of glass.
2. Materials used to make glass come in the form of raw materials.
3. Discovering the properties of glass.
4. The properties of glass vary with its use.
5. Present usage of glass has created an environmental problem.
6. Recycled glass serves as a new artificial raw material for man.
7. Man has the ability to solve problems relating to the environment.

NOTES TO THE TEACHER

There are seven concepts in this unit. Each concept has one lesson which is comprised of several activities. Several suggested extra activities have been added to further the students' investigations and enhance their understanding of glass and the problems related to glass. If all the activities and extra activities are done, this unit will take longer than three weeks. At least four or five days are recommended to do justice to concept seven.

The materials needed for this unit are common to most homes or schools. The items such as glass tubing, torches, and safety goggles can be ordered from the Service Center, extension 2528. Some might need to be purchased from the store but the intent was to have only materials that are easily available and can be recycled. The films and filmstrips are available from the Educational Resource and Administrative Center.

The object of the activities is to provide learning experiences in which the student can participate actively. Students like to watch things and ask questions but they would rather be involved actively in their learning experiences. When they are actively involved, motivation is no problem.

The evaluation components are such as to require little reading. They are mainly observations of the learning process or demonstration by students of skills learned by their becoming more proficient with these skills.

This I hope will be an exciting and rewarding unit for both the students and their teacher.

At times when using the inquiry technique the teacher wonders what, if anything, has been learned by the students. The following checklist published by the Florida State Department of Education can be used to provide the teacher with convenient ways to record observations or judgements for evaluating the inquiry process when working with students. Use the checklist in conjunction with concept one and two.

TEACHER EVALUATION*

To check for growth in process of inquiry

Grade:

Teacher:

Year:

Names of Children

Suggested a prediction						
Offered ways of testing prediction						
Changed opinion for better idea						
Selected materials with purpose						
Used "I think," "I don't know"						
Criticized his own work						
Observed carefully						
Stated relationships while observing						
Repeated work and/or changed for better procedures						
Used data to draw inferences						

* **Science in Florida Elementary Schools.** State Department of Education, Tallahassee, Florida. Bulletin 73. 1967. pp. 218-223. (This and the following three checklists adapted with permission.)

TEACHER EVALUATION

Evaluating performance with manipulative materials

Grade:

Teacher:

Year:

Names of Children

Manipulates materials with ease						
Observes closely while working						
Reveals stick-to-itiveness						
Suggests new uses of materials						
Finds relationships						
Avoids hasty inferences						
Describes discoveries clearly						
Asks new questions						
Independent in clean up						
Uses safety precautions						

TEACHER AND CHILDREN EVALUATE AN INVESTIGATION (GROUP)

Problem:

1. What did we do that helped you most to find an answer to our question?	
2. What could we have done better?	
3. What new ideas did we discover?	
4. What new words did we learn from this study?	
5. If you tried the experiments at home, were the results the same as in school?	
6. What predictions were we able to test with the materials we had?	
7. What different ways could we have used to keep records of our observations?	
8. What materials and equipment helped us most?	
9. What equipment did we have to construct?	
10. How did we use numbers and measurement to help find answers?	

These questions will need to be revised, some omitted, others added to be appropriate for different age groups and for the particular investigation to be evaluated with children.

MASTER MATERIALS LIST FOR A CLASS OF THIRTY

one box (12 x 12 x 12 with a top)
cardboard
tagboard - different sizes
jars of various sizes, shapes, and colors
bottles of various sizes, shapes, and colors
garbage cans
art supplies
- pencils
- water color paints
- water color brushes (various sizes)
- tempera paints
- tempera brushes (various sizes)
- newsprint (9 x 12, 12 x 18, 18 x 24)
- poster paper (various sizes and colors)
- butcher paper
- construction paper (9 x 12, 12 x 18, 18 x 24) various sizes and colors

15 erasers
rulers and yard or meter sticks
compasses for drawing circles
felt pens of a variety of colors
crayons
paste
5 containers of glue
5 rolls of masking tape
30 scissors
1 cup limestone
1 teaspoon sodium carbonate
sand (several samples from different areas)
30 pieces of glass tubing
5 gas torches
10 safety glasses
5 tongs or test tube holders
30 straws (assorted diameters)
5 bottles of bubble blowing solution
1 quart of soapy water
15 baby food jars
15 paper cups
30 paper bags
30 plastic bags
red and black obsidian

FILMS:

Ah Man See What You've Done: A story of how man is polluting his oceans and what he is beginning to do about it. An excellent film dealing with concepts of ecology.

Garbage: A film without words that suggests that there is a tragic comic quality about everything that has to do with man - even his garbage. Opens with an ironic sequence showing that garbage cans have character, and ends with a Dantesque scene in a dump where strange mechanical monsters flounder about in a world where there is nothing but garbage.

Master Materials List (continued)

FILMS:

Glass: This film can be checked out from the Seattle Public Library. The film which is set to music covers glass blowing and glass manufacturing.

Litterbug: Donald Duck appears in the role of the litterbug, public nuisance number one, the most contemptable pest known to mankind.

Recycling Waste: Shows how raw materials can be conserved and pollution curbed by burning waste materials into useful products. It illustrates how paper, glass and metal can be recycled, thus turning waste and trash into a resource; opens up the question of who will bear the cost for clearing up the environment. Closes with suggestions for solutions.

Speaking of Glass: This film can be checked out from the Seattle Public Library. It shows the complete process of glass production found in a manufacturing plant in Holland.

Trouble With Trash: Shows the problems resulting from the increase of solid wastages and what approaches exist for disposal.

FILMSTRIPS:

Solid Wastes: Scrutinizes this major environmental problem in a thoughtful, unhysterical manner; suggests specific and meaningful activities for students to help combat pollution in their own communities.

BOOKS:

It's Our Future, Knight/Moore, Ecological Science Series
It's Our Choice, Knight/Moore, Ecological Science Series
It's Our World, Knight/Moore, Ecological Science Series
Pollution (Examining Your Environment), Mine Publications
Fun With Chemistry, Gilbert, Hall of Science

RECYCLING HANDBOOKS AVAILABLE:

Oregon Recycling Information and Organizing Network (ORION)
2637 South West Water Avenue
Portland, Oregon 97201

Recycling
Educational Services Division
Rodale Press, Inc.
Emmaus, PA

Master Materials List (continued)

RECYCLING HANDBOOKS AVAILABLE:

Glass Containers
National Industrial Pollution Control Council
U. S. Government Printing Office
Washington, D.C. 20402

The Solid Waste Fact Book
Manufacturers Institute, Inc.
330 Madison Ave.
New York, New York 10017

CONCEPT 1

CONCEPT: An inquiry investigation of the characteristics of glass.

MATERIALS:
a small cardboard box
masking tape
a jar or bottle

PROCEDURE: Prior to placing the jar or bottle into the box, it is helpful to the teacher to have weighed, measured, and familarized himself or herself with the object. This enables the teacher to more confidently ask the students questions.

Take the glass boject and place it in the box taping it securely closed so that the box may be handled or shaken.

After taking the box and shaking it a few times, the attention of the class should be captured. Explain to the class that there is something in the box and they are to identify it. Tell them that all that is known about the object are its characteristics or properties. The teacher is to explain that he does not know what it is or its name.

The teacher then writes the words "characteristics" and "properties" on the chalkboard. Next, either through free response from the students or the teacher's use of an object such as an orange, the idea that size, shape, weight, texture, etc. should be illicited. With these done the class is ready to proceed with the lesson.

Next explain the rules for the exercise. The students are to ask questions that can be answered by the teacher with a yes or no. If the students attempt to guess or speculate as to what the object is, the teacher is to respond by saying: *You must know what an orange, for example, is, so why don't you ask some questions to check out your idea.*

The student might retort, "Does the object weigh ten pounds?" The teacher could respond with a "yes" or a "no" depending on the object's weight. If a student asks more than one question in one question ask him to ask the question again taking one part at a time. The students should raise their hand to be recognized. When he is finished he should say "I pass" and the next student is recognized. There are no right or wrong answers to this lesson. With a large group of students (fifteen or more) it might be necessary or desirable, to limit the number of questions a student may ask at one time. This will enable more to be more actively involved.

The object is to have them further develop their senses of inquiry and to do away with the feeling of right and wrong answers or that there are good and bad questions. With practice the students develop more skill with their questioning. Please do not open the box after completing the lesson, but wait a few days.

Optional: The teacher could tape the inquiry session to check on technique and the types of questions asked by the students. Do the questions fall into any pattern? Are the students asking simple data, informational, permissional questions; or are the students asking questions for clarification or deeper understanding? Are the students able to hypothesize? Are they model building? The teacher then could make a check list of the processes involved in searching out the answer. The teacher could try other similar inquiry sessions to see if there was repetition and how he could improve their question asking technique.

EVALUATION COMPONENT:

In the case of this lesson it is quite difficult to construct a test. Observing the students respond to the lesson by their questioning, their enthusiasm, and the interaction among the students gives an indication as to their learning.

SUGGESTED EXTRA ACTIVITY:

Have the students recall the characteristics of the object and list them on a sheet of paper. Next have the students make a list of the various possibilities that the object could be. Now the class can have an evaluative discussion enabling the students to make logical deductions as to what is in the box.

CONCEPT 2

CONCEPT: Materials used to make glass come in the form of raw materials.

MATERIALS:
a jar with a lid
½ jar of sand
some limestone
some sodium carbonate
cardboard box
masking tape

PROCEDURE: Place the sand, limestone, and sodium carbonate into the jar being sure to fasten the lid tightly and then place the jar into the box in preparation for the lesson.

The instructions and directions for this lesson are the same as those found in Concept one. The materials have been selected for a special purpose. Combinations of sand, limestone, and sodium carbonate when sufficient heat is applied, combine to make glass.

After the inquiry session is terminated by the teacher, it is suggested that the box in this case be opened, the various components properly identified and then discussed. It is important that the students see the connection between the ingredients and the glass jar and that being that they are essentially the same. The only missing ingredient is the heat necessary to make the transformation.

Explore with the students when did man first discover how to make glass, and what did he first use it?

EVALUATION COMPONENT: Here again the evaluation is to be based on observation. The students' questioning will probably be more sophisticated, they will continue to be motivated, and they should be listening and working more closely together to solve the problem.

SUGGESTED EXTRA ACTIVITIES: Collect samples of a variety of sand. Examine these under a microscope or a mangifying glass. The students could also examine the limestone and sodium carbonate.

Have the students examine samples of red and black obsidian which is natural glass formed from volcanic eruptions. Discuss the likeness and the differences of obsidian and manufactured glass.

Have the students make a time line showing the history and development of glass making through the history of man. They could find pictures or illustrate the development of glass.

CONCEPT 3

CONCEPT: Discovering the properties of glass

MATERIALS:
glass tubing in 4" to 6" pieces - one for each student
butane torches - one for every six students
safety goggles - at least six
tongs or test tube holders
metal tray or asbestos pad (one for each torch)
straws
old pipes
paper cups
bubble blowing solution or a soapy solution
bubble gum

FILMS: Speaking of Glass
Glass
} Seattle Public Library

BOOKS: Fun With Chemistry

PROCEDURE: Pass out the pipes or straws so that each student has one or the other. It is advisable to get as many pipes as possible for the lesson will be more successful. If the teacher is concerned about newspaper could be spread on the students' desks or in a certain area of the room.

Suggest to the students that they start blowing bubbles. After awhile have a contest to see who can blow the largest bubble and those who can blow bubbles within bubbles or some other interesting configuration.

Then discuss with the students as to why certain bubbles are larger, why some burst more quickly than others, and what does one do to get different configurations.

Ask the students who blew the various sizes and type of bubble to explain how they achieved them. Such things as air pressure, amounts of air, blowing evenly, straws and pipes having different diameters should be discussed or hypothesized by the students.

Another item could be used in place of the bubble solution that the students are very familiar with and that is bubble gum. It can be used to illustrate many characteristics of glass and the difficulty of working with glass.

For the next part in the lesson the students need the butane torches, enough glass tubing for each member to have a four to six inch piece, safety goggles for every student who is either an active participant or an observer, tongs or test tube holders, and metal trays in which to place the hot glass pieces.

It is suggested that for the next step the teacher make a decision as to whether he or she demonstrates the rest of the lesson using the butane torch and glass.

If the decision is that students become actively involved, these are definite items that need to be discussed and demonstrated before the students actually participate themselves.

a. Explain and discuss how to use a butane torch. Make sure that when lighting the torch that it faces away from yourself and others.

b. The torch should be placed on an asbestos pad and left there until the users are finished.

c. Students are to wear safety goggles at all times to prevent accidents to eyes. This encompasses those who are working with the glass as well as those that are watching.

d. Discuss pulling from their experiences why one is to be careful while handling glass. Ex. easily broken, sharp edges, cuts, etc.

e. Explain that glass melts when it reaches a certain temperature and even though it looks cool enough to handle it still may be hot enough to seriously burn.

Before proceding any further with the lesson the class should be divided into groups of six who will work with a torch.

Set up with the students a schedule so that there will only be two students at a torch and that they take turns giving each an equal opportunity if they so desire it.

Set up the torch stations. The torches are to be placed on the asbestos pads, each station to be set up so there is plenty of room for mobility, and the trays to be set up for the hot glass.

Hand out the goggles for the active as well as passive participants.

The students put on the goggles and then pick up the glass with which they are going to work

Light the butane torches.

The students are to use tongs and/or test tube holders to hold the glass while working with it.

The teacher might from time to time demonstrate for the students or if some student does something interesting with the glass tubing, have them demonstrate how they did it. The object of this lesson is to have the students explore further some of the properties of glass.

The next activity would be a showing of a film on glass blowing and the manufacturing of glass items. The films Speaking of Glass and Glass would be good. The students should react very positively to this since they have just worked with glass. Discuss how glass is manufactured and how glass is blown as well as the related employment.

EVALUATIVE COMPONENT:

Have the students list on a sheet of paper all the things that they found out about glass. If some students have difficulty suggest that they could work in teams or illustrate the properties discovered or observed.

SUGGESTED EXTRA ACTIVITIES:

The students using the same material from the section of the lesson that involves glass exploration, could proceed further by making glass beads, blowing glass bubbles, making a glass submarine, swimming polliwogs, or a drinking tube. These ideas are found in the book Fun With Chemistry published by Gilbert Hall of Science.

Have the students compare glass products made by hand and those that are made by machine. Explore the uniformity of the products and the speed in which they are made.

Invite a glass blower into the class or take a field trip to a glass blower.

Have someone research the history of glass blowing and its present day status.

CONCEPT 4

CONCEPT: The properties of glass containers vary with its use.

MATERIALS:
glass objects of all sizes, shapes and colors
paper (newsprint, construction, butcher, etc.)
pens of various colors
paints
paint brushes

PROCEDURE: Have the students make a list of the glass jars and bottles found in the student's home.

Which basic foods come in glass jars and bottles? The students are to make a list of as many as they can think of. They then can share their list with the class and then they could make a composite list for the classroom.

Arrange a field trip to a local store so that the students can do a survey of the different types of packaging for the various products. The students are to check to see how many ways the same product is packaged for sale. Upon returning to the school have a discussion on the result of the survey and on the pros and cons for each type of packaging. After the students have come to their own conclusions, following the discussions, they could respond or react in a variety of ways. They could debste the different modes of packaging, prepare a presentation to others on packaging, do a bulletin board, do a poster, or write letters regarding their opinion on packaging.

While at the store the students could check on how many ways glass is used in the products - such as light bulbs, fiber glass, drinking glasses, etc.

Have the students find out why glass containers according to some are better containers than those made of metal, paper, or plastic at the present time.

Have the students make a collection of different colored glass containers. They then can compare the shapes, thickness of glass. and the purpose for which the glass objects have been manufactured. They could also explore why they thought the particular container was made of colored glass rather than clear glass.

EVALUATION COMPONENT: The students are to write a creative story about glass. They are to think of themselves as a glass container and are to tell why they are the color, shape, size, and thickness that they are. They are to convince the reader that they are the best of containers possible.

SUGGESTED
EXTRA
ACTIVITIES:

Arrange a field trip to a glass manufacturing plant. If that is not possible have the students telephone the public relations representative, or write for information about glass manufacturing.

Have the students start a classroom collection of pretty and unusual bottles and glass containers.

Glass containers are used for food, chemicals, cosmetics, beverages, and medicines. Select one and write a report about its use. Tell what there is about the glass container that makes it so well suited for the product.

Have the students investigate why certain products are found or packaged in white, brown, or green glass. They might also explore the thickness and thinness of the glass containers.

CONCEPT 5

CONCEPT: Present usage of glass has created an environmental problem.

MATERIALS: garbage sacks
paper bags
boxes

FILMS: Ah Man See What You've Done
Litterbug
Trouble With Trash

PROCEDURE: Start off with the film, Ah Man See What You've Done and discuss how man affects his environment.

Show the film Litterbug. Following this have a short recap by the students of the film and a discussion of the litter problem.

Have the students collect the litter found on and around the school as well as the surrounding community. They will need sacks for the litter. If you plan on having the students split up, you might need to call on parents to assist in the supervision of the project.

The students are to sort and count the various types of litter found. How much was made from paper, how much was made from metal, how much was made from glass, and how much was made up of other things such as vegetable matter, etc.

The students then make charts or bar graphs to illustrate the amount of litter each of the preceeding groups made.

Discuss and explore how each type of litter affects the environment. Write the word inert on the chalkboard. Have the students define the word.

Have the students take samples of each group and place them in an area to observe the changes in each as the elements work on them. Observe and discuss the changes in each. The fact that glass is inert should be explored. Discuss how glass can or has created an environmental problem or hazard.

Show and discuss the film The Trouble With Trash. Explore what the community does with it's garbage.

EVALUATION COMPONENT: From the collection of litter around the school the students are to sort and count the different types of litter found. They then are to chart it so that they are able to compare the amounts of litter found. They are to then check this finding with national findings.

SUGGESTED EXTRA ACTIVITIES:

The students could take parts of the litter found from the litter campaign and make a sculpture or a collage related to some form of the litter problem.

A litter campaign could be planned and executed for the school service area. Parents, both girl and boy scouts could be called on to help plan and execute the project.

The students could make a commercial against litter for a radio broadcast.

The students could make some designs or pictures from glass, bottle caps and/or other litter.

Have students made a mosaic out of broken glass of a variety of colors.

CONCEPT 6

CONCEPT: Recycled glass serves as a new artificial raw material for man.

MATERIALS:
glass containers of various sizes, colors and shapes
glue
paper
masking tape
glass cutter
string (heavy)
sand paper
bottle cutter

PROCEDURE: Restock the supply of glass containers. These containers should come from the collections that were made earlier.

Review with the students the meaning of recycling. One might start by reviewing or presenting the word cycle and using several examples in explanation. A very simple example would be the seasonal cycle. Others such as the life cycle of humans. This is good because they can more readily relate to it. Once they understand this, they can give other examples and explain why each is a cycle.

Next present the prefix re. This could be done by writing the letters RE on the chalkboard. Ask what that is. Their responses could be many and varied. One of the most obvious would be the letters R and E or RE. Some might propose that it is a prefix. If that is not done, present the re as a prefix and review or present it meaning: again; back, as before. With this knowledge, apply it to the word cycle to make recycle. Ask the question, "What does recycle mean?" The students should easily figure out that recycling is finding another use for an object or reprocessing a material for another use.

Have the students do research on the recycling of glass and the various uses of recycled glass.

Introduce the word cullet next asking the students if they discovered what it is through their research. If not, explain what it is.

A follow-up activity would be to devide the class into groups of five or six students. Give each several glass containers of a variety of sizes, colors, and shapes along with the directions that they are to figure out as many ways as possible to reuse or recycle the glass objects.

Following the directions for using a bottle cutter have each student who want to, make a glass. Be sure that the edges are well sanded and smooth before they use the glasses.

EVALUATION COMPONENT: The students are to display their finished products and explain their use. Students are to be evaluated on their creativity and variety of items or ideas used.

SUGGESTED EXTRA ACTIVITIES: Have the students make candlesticks by assembling various glass objects by glueing.

Have the students use the bottle cutter to make wind chimes or hanging mobiles.

THINGS MADE FROM GLASS AND/OR RECYCLED GLASS

jars
bottles
medicine containers
* building bricks
storage containers
terrariums
fish bowls
candlesticks
* sandpaper
* glass wool
* reflective paints
* sewer pipes
* costume jewelry
* grit for poultry
* glasphalt
planters
glass furniture
light bulbs
sculpture
dishes
chemical containers
miniature hot houses
specimen containers
windows
* fiber glass
decorations
drapes
mirrors
magnifying glass
telescopes
microscopes
aquariums
glass straws

* Indicates items that are from recycled glass.

CONCEPT 7

CONCEPT: Man has the ability to solve problems relating to the environment.

MATERIALS:

Art supplies:
- watercolor brushes
- lettering brushes (optional)
- assorted watercolors
- assorted tempera paints
- poster board
- butcher paper
- assorted construction paper of various sizes
- glue
- paste
- scissors
- assorted colored felt pens
- assorted sizes of newsprint

garbage cans
boxes of various sizes
ditto paper
ditto master
plastic sacks
paper sacks
FILMS: Garbage
Recycling Waste
FILMSTRIP: Solid Waste

PROCEDURE: Show the films Garbage and Recycling Waste. They are both very good films and should have the students motivated for a class discussion. A special emphasis should be placed on the suggested solutions for cleaning up the environment and how that relates to the students, the school, their homes, and the community in which they live.

Show the filmstrip Solid Waste. Especially discuss the suggested student activities to help pollution. Following the discussion present the scientific approach to problem solving and explain how a scientist would use this technique. There are ten steps to the technique. They are found in the book It's Our Future, page ten and are as follows:

1. Identify the problems to be solved.
2. Describe the problems.
3. Explain exactly the terms to be used.
4. Identify possible solutions.
5. Investigate the evidence.
6. Explore probable solutions.
7. Collect and classify information and evidence.
8. Evaluate and study evidence.
9. Arrive at a solution.
10. Prove the solution is the best possible.

There may be a need to reword some of the steps so that the technique is more easily understood. Once the tehnique and terminology is understood, the students should be quite able to work with it under the necessary teacher guidance.

Since glass has been the theme of this unit, use this technique to set up a glass recycling center for the school. This will provide the students with a problem that is real and something with which they can do something about. There are many other advantages. The project allows the students to work together creatively and cooperatively toward a common goal, they have to shoulder more responsibility, the success of the project is very evident to them, they are assisting and being involved in a community proglem, and of course they can earn money for the school with which items excluded from the school budget can be purchased. Playground equipment, athletic supplies and equipment, art supplies such as glazes, pottery clay, or special paper, music supplies, and so on are things which could be bought with the proceeds from the recycling project. This project can be of long or short duration. A lot depends on the classroom situation and school facilities.

Survey the class to see of there is anything that they would like to have at school or in the classroom. They could survey the entire school as well.

Discuss how money can be made by recycling or collecting glass.

Using the steps outlined before, set up a recycling center for the classroom or school. It is advisable to use large pieces of paper or the chalkboard to write down the steps for all to see. The exercise could also be taped.

There are some basic problems that need to be explored when the class first begins the project. They basically fall into five categories: collection of the glass, the sorting of the glass, storage of the collected glass, locating the recycling centers, and transportation of the collected glass to the recycling centers.

Areas to be explored in the collection of glass will probably vary from situation to situation. Organizational patterns for collection, who is going to do it, when will it be done, how will it be done are problems to be considered.

Storage of the glass is a major problem. Most classrooms are not equipped with large storage areas but this problem is not insurmountable. If there is an extra classroom, a portable, or some extra storage area that would be great for the classroom would have more working space. The other glass such as jars, catsup bottles, etc. which can be stored in large garbage cans.

Locating the recycling centers can take time but it is a fine experience for the students. It gives them an opportunity to use communication skills to obtain information. To assist in this search the teacher will find a list of recycling center attached to this unit.

The sorting of the glass is quite easy. The information regarding sorting can be found by contacting the recycling centers. The students can easily perform this task. They could make charts or graphs to keep records as to the type and quantity of glass collected.

Transportation of the collected glass can present a problem but many parents are very willing to assist in this worthwhile project when contacted. Jess Jones has in the past come to the schools to pick up the recyclable bottles which cuts down on the transportation problem.

To publicize the project the students design and make handbills, make signs and posters, write a script for a commercial and do a skit at school assmebly.

EVALUATION COMPONENT: The manner in which the students understand the scientific approach to problem solving should be quite evident in how the project progresses. The students should demonstrate more sophisticated skills in problem solving either working in a committee or independently.

SUGGESTED EXTRA ACTIVITIES: Arrange a field trip to a land fill or a transfer station to observe the materials dumped. Have the students find out how much it costs and what some of the problems are. The students could interview some of the people who work at the transfer station about the problems and how they would solve these problems if possible.

Have the students explore or research the occupations related to the manufacturing of glass and glass products and glass recycling.

GLASS RECYCLING CENTERS

Part of this information was compiled by a 7th grade Camp Fire Girls group, "Tanki Da Kanya", from Pacific Junior High School, Mrs. John Benedict, Advisor, TR 8-7569, and under the further assistance of Cliff Maudslien, Highline Public Schools, 433-2453.

General Instructions: Glass should be clean, sorted as to color (white, brown, or green) and lids and metal rings should be removed. No window glass please!

Northwestern Glass, 5801 E. Marginal Way, RO 2-0660. Recycles any beverage glass 1¢ a pound. Open Tues. & Thurs., 9:00-2:00, Sat. 8:00-4:30.

Rainier Brewing Co., 3100 Airport Way So., MA 2-2600. Recycles Rainier beer bottles, 50¢ per case. Open 9:00-6:00 Monday-Friday. Also buys aluminum cans 10¢ a pound.

Glaser Beverage, 2300 26th So., EA 3-2932. Will recycle all kinds of glass or glass containers. Pays 1¢ per pound. Open Monday, Wednesday and Friday 10:00-2:00.

Cascade Recycling, 23898 Pacific Highway So., Rainier, Olympia and Lucky - 40¢ case; Heidelbert, Reinlander and Blitz - 25¢ case; also aluminum cans 1¢ for 2 cans. Open Monday-Friday 10:00-7:00, Saturday and Sunday 9:00-6:00. (Call for group rates.

For your added convenience, the independent Recycling Centers listed below will pay you 40¢ per case of 24 for empty Rainier recyclable bottles:

J & M Recycling Center
2313 First, Seattle
624-3341
Monday-Saturday
9 a.m.-6 p.m.

Rob's Interbay Texaco
2601 15th West
285-9876
Monday-Saturday
9 a.m.-7 p.m.
Sunday
10 a.m.-6 p.m.

Rob's Texaco & Recycling Center
13711 Aurora North
EM 3-8433
Monday-Saturday
9 a.m. - 7 p.m.
Sunday
10 a.m. - 6 p.m.

Rob's Burien Texaco
13420 Ambaum Blvd., Burien
246-1535
Monday-Saturday
9 a.m. - 7 p.m.
Sunday
10 a.m. - 6 p.m.

Arnold & Sons
301 W. Main, Auburn
TE 3-7530
Monday-Saturday
8:30 a.m. - 5 p.m.

Arnold & Sons
722 W. Smith, Kent
UL 4-2727
Monday-Saturday
8:30 a.m. - 5 p.m.

Renton Recycling
1555 No. 4th & Houser Way No.
BA 8-1420
Monday-Saturday
9 a.m. - 5:30 p.m.

Coalfield Recycling Center
16630 Sunset Hwy. So.
Coalfield
BA 6-5239
Daily 10 a.m. - 6 p.m.

Northwest Reclamation
10426 16th S. W.
White Center
CH 4-2233
Monday-Saturday
9 a.m. - 7 p.m.
Sunday
12-5 p.m.

Fat Albert's Rocket & Recycling Center
25045 Pacific Highway South, Midway
VE 9-9872
Daily
6 a.m. - 11 p.m.

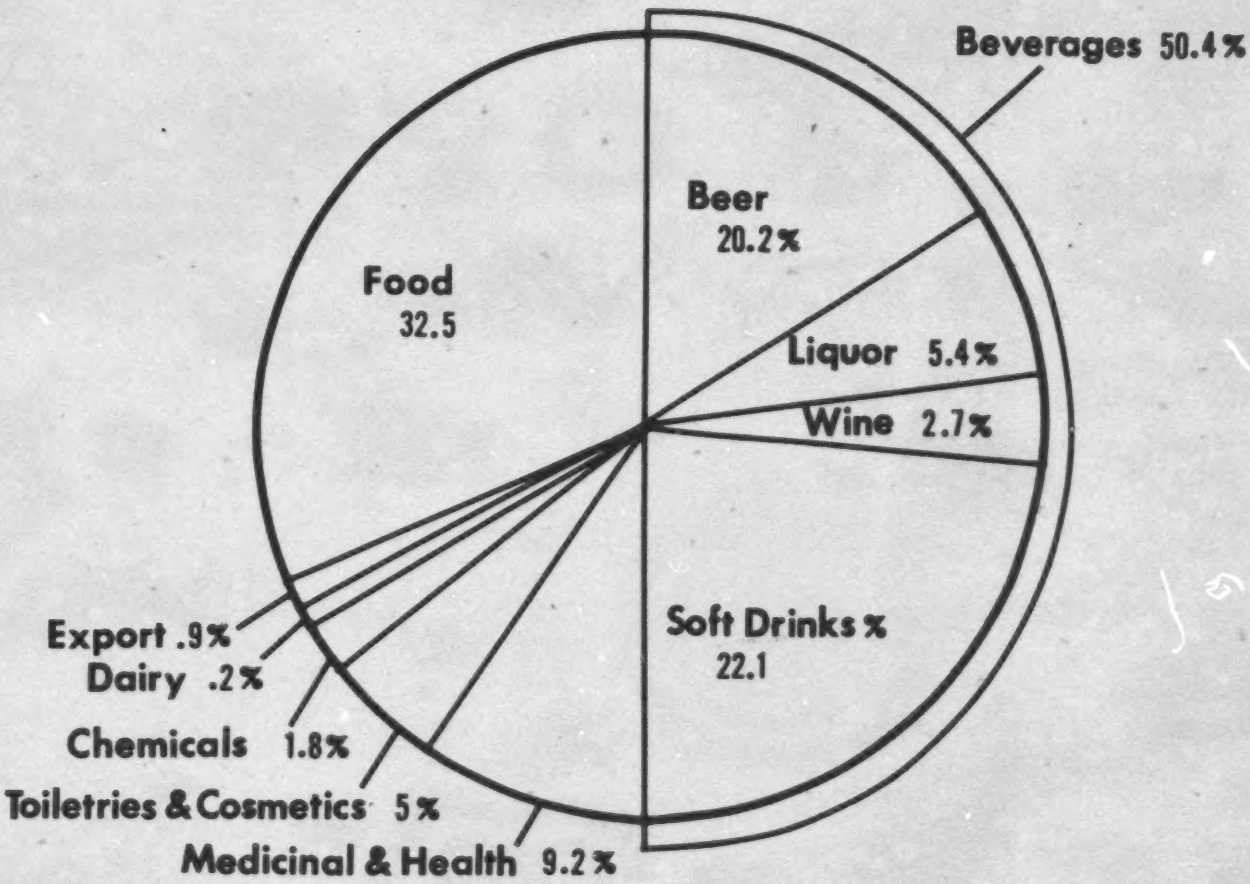
Northwest Reclamation
223rd & Marine View Drive
Des Moines
TR 8-2431
Monday-Saturday
9 a.m. - 7 p.m.

Kirkland Recycling Center
733 7th
822-3911
Monday-Saturday
10 a.m. - 6 p.m.

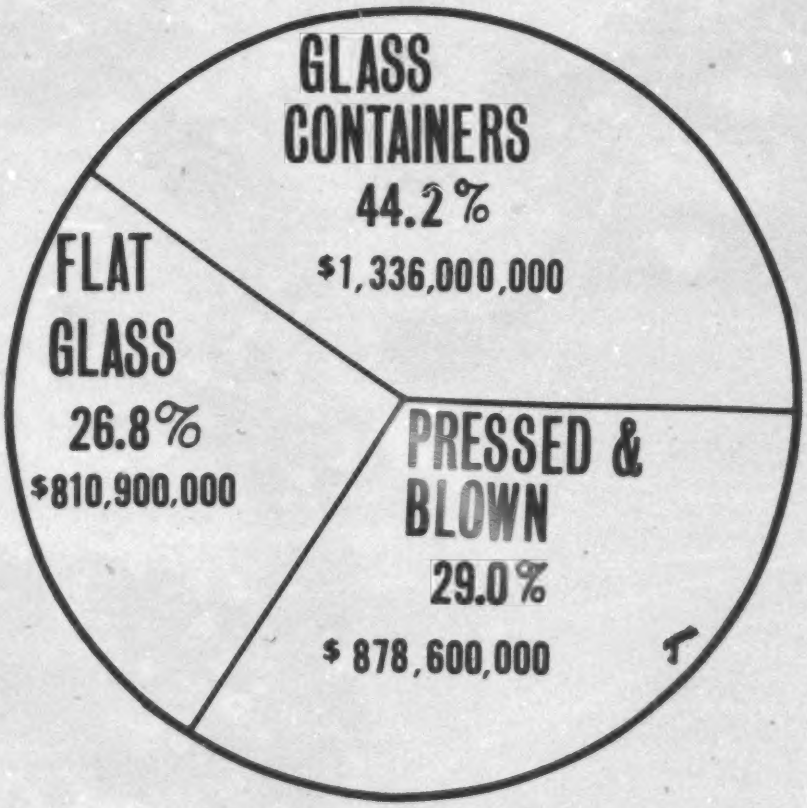
DISPOSITION OF RECYCLABLE BOTTLES

WHO:	Jess Jones at MA 4-3341
WHICH:	Olympia, Rheinlander, Heidelberg and Lucky beer bottles
HOW MUCH:	Stubby bottle, case of 24 - 25¢, tall Oly, Lucky 12 oz. & 16 oz. Rainier (most all tall or 16 oz. bottles) 40¢ per case.
WHEN:	Minimum load of 25 cases. Call and he will deliver new boxes for the different brands as well as take the recycleable bottles.
OTHERS:	All Dr. Pepper, Hires and Crush bottles, 10 oz., will pay 1¢ each for 25¢ per case. No deposit and no return bottles, 10 oz., of 7 Up, Royal Crown, Honeydew and Pepsi Cola, 15¢ per case. All 32 oz. soft drink bottles, no deposit and no return, 1¢ per bottle. These bottles weigh about a pound so for storage purposes might be better to dispose of them in with the broken glass to N. W. Glass.

Percentage Breakdown Of 1969 Glass Container Shipments

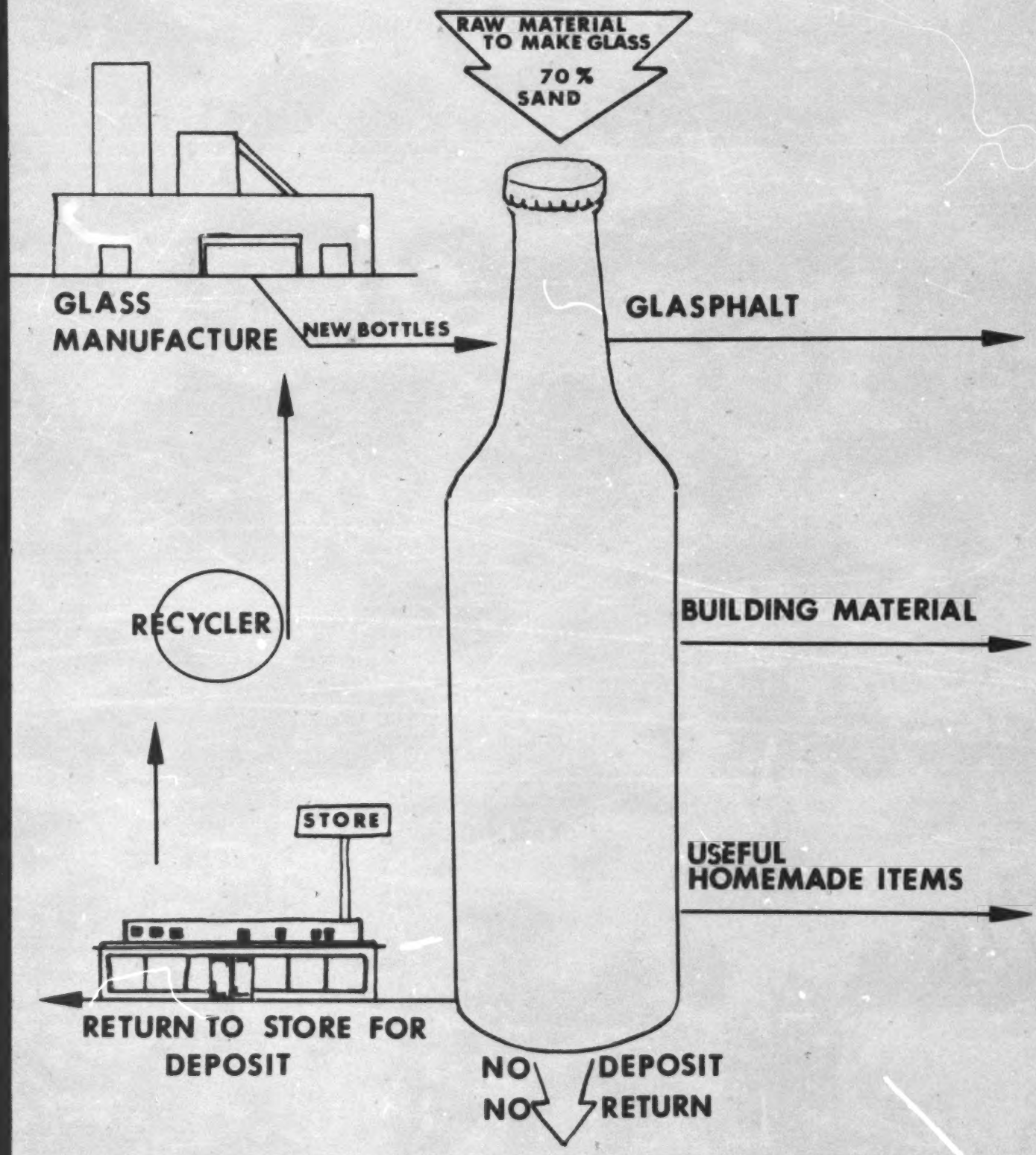


VALUE OF GLASS PRODUCTS



SOURCE: U.S. DEPARTMENT OF COMMERCE 1967 CENSUS OF MANUFACTURES, OCTOBER 1969

RECYCLEABLE BOTTLES



For your convenience the films used in this ELE are listed on this tear out sheet. Simply add the dates required and mail to the Instructional Material Center, ERAC.

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Detach here

INSTRUCTIONAL MATERIALS - HIGHLINE PUBLIC SCHOOLS

Symbols for materials not booked:
NA - not available
Sub - substitution
WD - withdrawn

ORIGINAL

Please try to place orders
3 weeks in ADVANCE in DUPLICATE

SCHOOL _____ TEACHER _____ GRADE _____ DATE _____

FILMSTRIP NO.	FILMSTRIPS - TITLE	DATE WANTED	NOT WANTED AFTER	DATE CONFIRMED	FILMS	DATE WANTED	NOT WANTED AFTER	DATE CONFIRMED
	Solid Wastes				Ah Man See What You've Done			
					Garbage			
					Litterbug			
					Recycling			
					Trouble With Trash			

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